7.4 Solving Financial Problems. Determining i and n.

Ex 1:
When Sean was born, his grandparents deposited $5000 in an account that pays interest compounded quarterly. No further deposits or withdrawals were made. On Sean's 25th birthday, the amount in the account was $22 160.23. What annual rate of interest did the account pay?

$A = P(1+i)^n$

$\frac{22160.23}{5000} = \frac{5000(1+i)^{100}}{5000}$

$\sqrt[100]{\frac{22160.23}{5000}} = 1+i$

$1.015 = 1+i$

$1.015 - 1 = i$

$i = 0.015$ ← this rate per period (qtr)

rate $= 0.015 \times 4$

$= 0.06$ ← annually

∴ the annual rate is 6%

Ex 2:
Chad invests $1500 into a savings account that pays 6% compounded semi-annually. How long will it take Chad to triple his money?

$1500 \times 3 = 4500 (A)$

$\frac{4500}{1500} = \frac{1500(1+\frac{0.06}{2})^n}{1500}$

$3 = (1.03)^n$

$n = \frac{\log 3}{\log 1.03}$

$n = 37.17$

Recall

n = # of years × # of periods per year

then $\frac{37.17}{2}$

$= 18.6$

change to months

$= 0.6 \times 12$

$= 7.2$ round to the nearest month

∴ it takes approx. 18 years & 7 months.

Ex 3:
a) How long will it take for money to double at each interest rate compounded quarterly?
b) Is the time cut in half when the interest doubles?

i) 5%

$\frac{4}{2} = \frac{2\left(1+\frac{0.05}{4}\right)^n}{2}$

$2 = (1.0125)^n$

$n = \frac{\log 2}{\log 1.0125}$

$n = 55.8$ ← take out quarterly

$n = \frac{55.8}{4}$

$n = 13.95$

∴ approx 13 years & 11 months to double.

months 0.95×12

$\doteq 11$

ii) 10%

$\frac{4}{2} = \frac{2\left(1+\frac{0.10}{4}\right)^n}{2}$

$\frac{4}{2} = \frac{2(1.025)^n}{2}$

$2 = (1.025)^n$

$n = \frac{\log 2}{\log 1.025}$

$n = 28.07$

$\frac{28.07}{4} = 7.02$

∴ approx 7 yrs to double

Assigned Work: p 487 # 2, 3, 6 - 14